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ABSTRACT

This paper presents a case study of a sixth grade remedial math class which illustrates the thesis that only the "experimental attitude," not the "experimental method," is appropriate in the classroom. The thesis is based on the fact that too many independent variables exist in a classroom situation to allow precise measurement. The case study involved 23 sixth graders and their teacher, who referred himself and his class for help on behavioral management and instruction because he was concerned with students' resistance to work and hostility toward himself. Baseline data taken over a 5-day period produced certain assumptions about the class. From these assumptions, specific recommendations about the teacher's instructional presentation and the assigned work period were made in an effort to engineer behavior change and increase the students' grades. Subsequently, math grades and behavior did improve. A reversal to conditions prior to the experimental changes again produced disruptive behavior and poor grades. The findings were considered to be a result of the experimental conditions, but which of the conditions produced the change could not be discerned. Data tables comprise approximately one-half of the document. (SDH)

ALL THOSE INDEPENDENT VARIABLES

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I would like to begin by flatly contradicting something I published several years ago (Meacham and Wiesen, 1969)[1]. I wrote something to the effect that the classroom could be treated as a laboratory and that the teacher and psychologist by carefully manipulating variables and taking precise measurements could perform experiments which would give precise information as to what was going on in that classroom. With student behavior as the dependent variable and absolute control of other relevant variables, we had reached the millenium. I no longer believe that. Not that I am opposed to a little measurement and some precision, it's just that I think we are kidding ourselves when we believe we are doing experiments in the classroom. There are too many independent variables. We tend to slide over these or ignore them or even hope that they will go away or cancel each other out but there are still too many independent variables. Even multiple baseline studies don't do the trick. Now, it may be possible that some of our researchers may bring it off and do credible classroom research (although I certainly have some reservations about this) but I am not talking about that. I am talking about the ordinary school psychologist in the ordinary situation treating ordinary problems like learning disabilities, emotional disturbances, etc.

*Most of the work reported here was done by Gary Horton, Fred Vaughan, and John Mades, I just sat around and consulted.

[1]Meacham, M. L., & Wiesen, A. Changing classroom behavior. Scranton, Pa.: International Textbook, 1969.

He doesn't have time and neither does the teacher even if they had the resources. They have to make changes in a relatively brief period of time and, in order to maximize the possibilities of success, they have to deal with a lot of variables.

While I think the experimental method is not appropriate, I do believe that the experimental attitude is appropriate. We should feel like experimenters and keep a little data to tell us if we are getting some changes or to help us determine what it is we want to change. Teacher behavior, and to a lesser extent, psychologist behavior are important dependent variables and independent variables. But we should not behave like experimenters or we would never get anything done. We must juxtapose our research attitude and clinical attitude. These are comlimentary and not conflictive. An experimental attitude keeps us honest and the clinician in us keeps us creative. They work very well together.

I would like to illustrate my thesis by detailing a case study with a sixth grade remedial math class. The teacher referred himself and his class for help in behavioral management and instruction. He expressed considerable concern about the student's resistance towards their work and their displays of hostility towards him. He described the majority of his students as habitually engaging in one or more of the following behaviors:

1. Innattention
2. Delay in beginning assignments
3. Inconsistent effort
4. Frequent disruptive behaviors
5. Frequent incomplete and late assignments
6. More incorrect than correct work
7. Indifference to threats and the usual punishments

The class was composed of 23 sixth-grade students who met four mornings a week for 45 minutes of instruction. There were 15 boys and 8 girls. They had a history of substandard and failing performance in math although they had normal intelligence. The staff decided that the best approach to this particular set of problems was to work on the academic behaviors. With that in mind they took five days of baseline behavior on the class as a whole and on one target child who was particularly difficult (Tables I and II). After examining these data they arrived at certain assumptions about the class.

1. Based on their historical and immediate past math experiences in school, the students can anticipate being assigned and expected to do math work which they may be unprepared to process correctly. Thus, they may expect to respond incorrectly, and receive the consequences, i.e., a negative evaluation, a threat, and in some cases a paddling.

2. Most persons will spontaneously try to avoid repeated unpleasant consequences. For the students in the low math group avoidance often may take the form of not attending school, putting-off doing the assignments, and pretending or even believing themselves to be markedly incompetent ("dumb" and "stupid") in math.

3. Generally, the net effect of such repeated failure experiences is to create anger and/or resentment toward teachers who repeatedly assign, or set them up to do, more than they believe they can do. Changing the person who sets the goals and expectations may be a means of dealing with these negative feelings.

4. Most persons find satisfaction in setting their own goals and expectations (i.e., do their own thinking, planning and goal setting.) "Calling our own shots" can be more pleasant on most occasions than being told what you must or must not do.

5. Students may know as much or more about their own mathematical capabilities than do the teachers who set the expectations too high for them to experience success.

6. Students will have an opportunity to realize the nature of their capacities and limitations when they are given the responsibility and experience of deciding how much of the work they can correctly do in a given length of time.

7. Students can learn to realistically set their own goals in such a way as to maximize the probability of being correct or "right," especially in the presence of their peer group. This will be especially true, if the teacher encourages them to set their goals such that there is a maximum chance of success.

8. It is likely that, over a period of time, students will set their goals higher and also increase their number of correct math responses.

9. Students who repeatedly succeed in math should come to believe they are improving and may be even "good" at math. Thus, they can to some degree be able to identify themselves as competent students in the area of mathematics.

From these assumptions they made the following recommendations to the teacher:

Instructional Presentation (Approximately 15 minutes per day)

1. Explanation:

   Explain the math concept(s) that will be dealt with during the work period.

2. Demonstration:

   Demonstrate the concept(s). Model and show the students the correct way of processing an exemplary problem, and leave at least one example of the correct processing on the blackboard. With new concepts, be sure to involve one or more students in the demonstration until they can produce at least one sample of the correct processing when they make inappropriate attempts at processing. Remember to keep the correct way of doing the problems immediately available to them in some form.

3. Expectations

   Give specific and descriptive instructions relating to the assignment to be done during the work period.

   a. Explain the student goal-setting procedure. Tell the students that they are to write at the top of their work paper the number of math problems (on the board, overhead or ditto) that they believe they can correctly complete during the work period. This is their goal, or target, to shoot for each day.

   b. Tell the students that you will be available to help them while they are working on the assignment. They can get your attention only by raising their hand. If they must wait for your attention, because you are tutoring someone else, the students should be encouraged to raise their non-writing arm and keep working ahead on the problems they do know how to solve.

c. State the amount of time they will be allowed for working the problems, and indicate when you will check their work for correctness.

d. Tell them you want them to reach their goal with correct and completed work.

Work Period (Approximately 30 minutes per day)

1. Tutoring--go to and help (reinstruct) those students who request it by raising their hand.

2. Carry with you on a sheet of paper the correct way of processing each problem assigned. Show it to the students as needed during your tutoring contacts.

3. Provide positive verbal and positive written feedback to the students for their appropriate math responses as you complete a tutoring or checking contact. Use such verbal forms as "good," "fine," "that one is right," etc., and then write a positive graphic form beside samples of their correct work (i.e., ___mark, C (Correct), "O.K.," "Good Work," etc.). Get in as many of these positive verbal-graphic feedback responses as you can manage during and between tutoring contacts.

4. Checking--allow the students to check their own work for correctness. Occasionally sample check or collect all the papers to assess the reliability of the student checking.

5. Reporting and Recording--keep a record of the students' efforts by having them report to you the goal they set for themselves, and the actual number of problems they worked correctly during the period. This reporting can be done with some degree of confidentiality by asking the students to give you their goal and results at your desk as they leave, or as they file past you at the door. The students' performances could be recorded on the following type of form:

Name	Goal Set	Number of Problems Completed	Number and Problems Correct

6. Consequences--allow finished students to go on to some other activity, preferably ones they enjoy. Discontinue the practice of making the consequences of working the assignment to completion one of additional work of the same type.

   Help students who finish the assignment early to think and plan their behavior of the immediate future by:

   a. Asking, "What are you going to do next?"

   b. Waiting for their response.

   c. Suggesting alternative activities only upon student request.

   d. Praising students who did as they said they would, example: "John, I like the way you got your library book out just like you said you would do."

Those are a lot of changes! There were several changes in teacher behavior and a significant one in the students in that we asked them to set their own goals rather than have the teacher do it for them. But these weren't all. During the time data were kept on this room there were 21 significant changes in curriculum as the teacher reviewed much of the math the students were supposed to know. (Table III)

Did we get any results? You bet! During the 30 days of follow-up the students increased their math scores significantly and they became much less disruptive. Even our target student improved. (Tables IV and V) Did what we do make the difference for these youngsters? Certainly, for we did an A-B-A design. We decided to be scientific and change everything back again except the curriculum. This was over the vociferous objections of the teacher who knew a good thing when he saw it but who reluctantly agreed. And under baseline variables we achieved baseline classroom conditions for just four days. Then the teacher revolted and returned to his new methods. (Table VI)

We never did learn just what made the difference in the children. Our more humanistic staff felt it was giving them decisions. Our more behavioral staff was convinced it was the change in contingency management; and our master teacher was sure it was the change in subject matter presentation. Nobody felt the curriculum had anything to do with it. Perhaps for each child it was something a little different. At any rate we learned not to be too concerned about experimental procedure in the complexity of the classroom but we did appreciate the experimental attitude and the data which kept us reasonably honest.

Table I

Baseline Data of Academic Behaviors for Entire Class

Daily Observations	1	2	3	4	5	
#of Students	18	18	18	18	18	
Number of Problems Assigned per Student	10	11	5	10	5	
Total Number of Responses Expected From Students	180	198	90	180	90	
Number of Correct Responses	51	99	46	43	33	
Percent of Correct Responses	28.33	50.00	51.11	23.88	36.67	
Mean percent of Correct Responses						36.85
Number of Students With Perfect Papers (Complete, Correct, on Time)	1	2	2	1	1	
Percent of Perfect Papers	5.56	11.11	11.11	5.56	5.56	
Mean Percent of Perfect Papers						7.78

Table II

Baseline Data of Academic Behaviors for One Student

Daily Observations	1	2	3	4	5	
Number of Problems	30	11	5	10	5	
Number of Correct Responses	4	4	0	1	0	
Percent of Correct Responses	40.00	36.36	0.00	10.00	0.00	
Mean Percent of Correct Responses						21.95
Number of Perfect Papers	0	0	0	0	0	
Mean Percent of Perfect Papers						0.00

Table III

Content of the assignments for the Sixth Grade

Low Math Group

A. Pre-Treatment Baseline Period

Days

1. Volume and labels.
2. Multiplication of 1 digit by 2 digit numbers.
3. Multiplication of sequence of 4 one digit numbers.
4. Multiplication of two digit by two digit numbers.
5. Multiplication of three digit by three digit numbers.

B. Treatment Period

6. 1 and 2 digit division.
7. 1 and 2 digit division.
8. 1 and 2 digit division plus checking.
9. 1 and 2 digit division plus checking.
10. Two digit division plus checking.

C. Follow-up I

11. Three digit division.
12. One and 3 digit division.
13. Two and 3 digit division.
14. One, two and three digit division.
15. One, two and three digit division.

D. Follow-up II

Days

16. Two digit by two digit and two digit by three digit division.
17. Two digit by two digit and two digit by three digit division.
18. Three digit by three digit and two digit by three digit division.
19. Cuisenaire Rods.

Table III (cont.)

20. Square Units.

E. Follow-up III

21. Cuisenaire rods and equations.

22. Equating fractions.

23. Equating fractions.

24. Multiplying fractions.

25. Multiplying fractions and reducing fractions.

F. Follow-up IV

26. Reducing and multiplying fractions.

27. Reducing and multiplying fractions.

28. Reducing and multiplying fractions.

29. Equivalent fractions.

30. Reducing equivalent fractions.

G. Follow-up V

31. Reducing equivalent fractions.

32. Dividing fractions and reducing.

33. Dividing fractions and reducing.

34. Common multiples.

35. Equivalent fractions.

Table IV

Treatment Periods	Treatment					
Daily Observations	6	7	8	9	10	
Number of Students Present	14	14	14	12	12	
Number of Problems Assigned Per Student	10	10	10	10	10	
Total Number of Responses Expected From Students	--	--	--	--	--	
Total Number of Responses Set By Students	72	79	70	51	53	
Number of Correct Responses	65	66	64	36	47	
Per cent of Correct Responses	90.27	83.54	91.42	91.80	88.67	
Mean Per cent of Correct Responses						88.95
Number of Students With Perfect Papers (Complete/Correct/ On Time)	9	10	9	9	8	
Per cent of Perfect Papers	64.28	71.42	64.28	75.00	66.67	
Mean Per cent of Perfect Papers						68.18

Table IV (cont.)

ACADEMIC BEHAVIORS DURING TREATMENT AND FOLLOW-UP FOR ENTIRE MATH CLASS

Treatment Periods	Follow-up I						Follow-up II					
Daily Observations	11	12	13	14	15		16	17	18	19	20	
Number of Students Present	14	14	13	17	16		23	23	23	14	13	
Number of Problems Assigned Per Student	10	10	10	10	14		10	10	10	40	10	
Total Number of Responses Expected From Students	---	---	---	---	---		---	---	---	---	---	
Total Number of Responses Set By Students	55	72	50	86	148		99	128	102	433	103	
Number of Correct Responses	48	50	40	82	144		87	108	66	360	90	
Per cent of Correct Responses	87.27	69.44	71.42	95.34	97.29		87.87	84.38	64.71	83.14	87.38	
Mean Per cent of Correct Responses					87.29							82.19
Number of Students With Perfect Papers (Complete/ Correct/On Time)	10	7	8	14	15		18	15	6	8	9	
Per cent of Perfect Papers	71.43	50.00	61.54	82.35	93.75		78.26	65.22	26.09	57.14	45.00	
Mean Per cent of Perfect Papers						72.97						58.33

Table IV (cont.)

ACADEMIC BEHAVIORS DURING TREATMENT AND FOLLOW-UP FOR ENTIRE MATH CLASS

Treatment Periods	Follow-up III						Follow-up IV					
Daily Observations	21	22	23	24	25		26	27	28	29	30	
Number of Students Present	12	17	17	19	19		19	20	20	18	18	
Number of Problems Assigned Per Student	20	10	20	20	15		10	10	10	15	15	
Total Number of Responses Expected From Students	--	--	--	--	--		--	--	--	--	--	
Total Number of Responses Set By Students	242	166	269	320	212		169	158	136	221	196	
Number of Correct Responses	210	146	260	307	167		135	132	109	207	174	
Per cent of Correct Responses	86.78	87.95	96.65	95.94	78.77		79.88	83.54	80.15	93.50	88.78	
Mean Per cent of Correct Responses						90.15						86.02
Number of Students With Perfect Papers (Complete/Correct/ On Time)	9	11	13	16	6		5	11	10	17	9	
Per cent of Perfect Papers	75.00	64.71	76.47	84.21	31.58		26.32	55.00	50.00	94.44	50.00	
Mean Per cent of Perfect Papers						65.47						54.73

Table IV (cont.)

ACADEMIC BEHAVIORS DURING TREATMENT AND FOLLOW-UP FOR ENTIRE MATH CLASS

Treatment Periods			Follow-up V			
Daily Observations	31	32	33	34	35	
Number of Students Present	18	19	16	17	16	
Number of Problems Assigned Per Student	30	15	10	10	10	
Total Number of Responses Expected From Students	--	--	--	--	--	
Total Number of Responses Set By Students	360	227	106	129	149	
Number of Correct Responses	353	210	91	108	137	
Per cent of Correct Responses	98.06	92.51	85.85	83.72	91.95	
Mean Per cent of Correct Responses						92.58
Number of Students With Perfect Papers (Complete/Correct/ On Time)	16	15	5	9	13	
Per cent of Perfect Papers	88.89	78.95	31.25	52.94	81.25	
Mean Per cent of Perfect Papers						67.44

Table V

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP (CONTINUED)

Treatment Periods	Treatment				
Daily Observations	6	7	8	9	10
Number of Problems Presented by Teacher	10	10	10	10	10
Number of Problems Student Assigned Self	.....	.....	ABSENT	.....	.....

Table V (cont.)

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP

Follow-up I

Daily Observations	11	12	13	14	15	
Number of Problems Presented by Teacher	10	10	10	10	14	
Number of Problems Student Assigned Self	1	2	Absent	4	Absent	
Number of Correct Responses	1	2	Absent	4	Absent	
Per cent of Correct Responses	100.00	100.00	—	100.00	—	
Mean Per cent of Correct Responses						100.00
Number of Perfect Papers (Complete/ Correct/ On Time)	1	1	Absent	1	Absent	
Mean Per cent of Perfect Papers						100.00

Table V (cont.)

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP

Follow-up II

Daily Observations	16	17	18	19	20	
Number of Problems Presented by Teacher	10	10	10	10	10	
Number of Problems Student Assigned Self	1	2	Absent	20	Absent	
Number of Correct Responses	1	2	Absent	20	Absent	
Per cent of Correct Responses	100.00	100.00	—	100.00	—	
Mean Per cent of Correct Responses						100.00
Number of Perfect Papers (Complete/ Correct/ On Time)	1	1	Absent	1	Absent	
Mean Per cent of Perfect Papers						100.00

Table V (cont.)

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP

Follow-up III

Daily Observations	21	22	23	24	25	
Number of Problems Presented by Teacher	20	10	20	20	15	
Number of Problems Student Assigned Self	14	5	5	5	5	
Number of Correct Responses	14	3	4	5	3	
Per cent of Correct Responses	100.00	60.00	80.00	100.00	60.00	
Mean per cent of Correct Responses						85.29
Number of Perfect Papers (Complete/ Correct/ On Time)	1	0	0	1	0	
Mean Per cent of Perfect Papers						40.00

Table V (cont.)

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP

Follow-up IV

Daily Observations	26	27	28	29	30	
Number of Problems Presented by Teacher	10	10	10	15	15	
Number of Problems Student Assigned Self	5	4	3	6	5	
Number of Correct Responses	4	4	3	6	4	
Per cent of Correct Responses	80.00	100.00	100.00	100.00	80.00	
Mean Per cent of Correct Responses						91.30
Number of Perfect Papers (Complete/ Correct/ On Time)	0	1	1	1	0	
Mean Per cent of Perfect Papers						60.00

Table V (cont.)

TARGET STUDENT IN SIXTH GRADE LOW MATH GROUP

Follow-up V

Daily Observations	31	32	33	34	35	
Number of Problems Presented by Teacher	30	15	10	10	10	
Number of Problems Student Assigned Self	5	5	3	3	3	
Number of Correct Responses	5	5	3	3	3	
Per cent of Correct Responses	100.00	100.00	100.00	100.00	100.00	
Mean Per cent of Correct Responses						100.00
Number of Perfect Papers (Complete/ Correct/ On Time)	1	1	1	1	1	
Mean Per cent of Perfect Papers						100.00

Table VI

Academic Behaviors After Return to Baseline Conditions

Daily Observations	1	2	3	4	Totals
Number of Students	18	18	20	18	74
Number of Problems Assigned per Student	10	10	5	10	35
Total Number of Responses Expected From Students	180	180	100	180	740
Number of Correct Responses	59	104	50	98	311
Percent of Correct Responses	32.78	57.78	50.00	54.44	
Mean Percent of Correct Responses					48.59
Number of Students With Perfect Papers	0	2	3	0	5
Per cent of Perfect Papers	0.00	11.11	15.00	0.00	
Mean Percent of Perfect Papers					6.76